Marine biogenics in sea spray: A new source of pharmaceuticals and nutritionals

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Sea spray is a complex mixture of inorganic salts and marine biogenics. Marine biogenics are molecules produced by marine organisms such as algae and bacteria. In general, these molecules are known for their harmful effects (e.g. algal toxins or bacterial toxins). Yet, some of these molecules can have potential beneficial health effects and are inhaled daily by people living in coastal regions. Our research has shown that marine biogenics in sea spray aerosols interact with key molecular targets in human cells. As such, these marine biogenics could be an underexplored potential health source and important biotechnological leads for new pharmaceuticals. In our research, we observed significant effects on the mTOR pathway. Similar to a known chemical mTOR inhibitor, we observed a downregulation of genes involved in the mTOR pathway after exposure to natural sea spray aerosols. Downregulation and inhibition of the mTOR pathway have been associated with positive health effects in numerous studies. Furthermore, we observed significant regulation of genes and pathways that are closely linked with mTOR most likely caused by the effects on the mTOR pathway. These genes and pathways include the new pharmaceutical target PCSK9 and the steroid biosynthesis. In our experiments, for all genes and pathways, the effects of the natural sea spray aerosol extract and the chemical mTOR pathway were highly similar. This suggests that sea spray aerosols contain molecules similar to the chemical mTOR inhibitor, at least in terms of effects, and highlight the potential of sea spray aerosols as new harmaceutical leads. Overall, these results provide a substantial molecular evidence base that marine biogenics in sea spray can be a health source for coastal populations.

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